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Specification and Drawings, as originally filed, with Application for Patent Serial No:
2,372,995, on February 25, 2002, by **BEAVER MACHINE CORPORATION**, assignee
of Josef W. Schwarzli, Bernard R. Schwarzli and Jens Ronneberger, for "Vending
Machine Tracking System".

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Abstract

A tracking system for bulk venders counts each vend responsive to rotation through a cycle of the coin mechanism, and preferably records the date and time of each vend. An active tag has a memory for storing data representing a vending event, for example the date and time of the event. The data is periodically read by an interrogator, which downloads the data stored in the tag memory and erases the memory to reset the tag for continued monitoring of the vender. With this information an operator can reconcile the number of coins collected from the vender with the number of vends recorded, determine when the vender is likely to need restocking, track when vends take place and over what period of time, and track the work habits of service personnel.

VENDING MACHINE TRACKING SYSTEM

Field of Invention

This invention relates to vending machines. In particular, this invention relates to a system for tracking vending machines and vended merchandise.

5 Background of the Invention

Bulk venders, colloquially known as "gum ball machines", are widely used for dispensing confectioneries and other small articles of merchandise. A typical bulk vender has a hopper assembly comprising a transparent globe which functions as a merchandise storage bin, seated over a dispensing wheel which revolves in a hopper. A
10 patron deposits the required coinage into the coin mechanism and turns the handle, which rotates the dispensing wheel to convey a preset amount of merchandise to the dispensing chute. The hopper assembly is located over a body which is mounted on a base, defining a secure compartment containing a cash box into which the coin mechanism ejects the deposited coins.

15 Bulk venders are typically purchased and maintained by vender operators, who install and service the venders at high traffic locations such as shopping malls, restaurants and the like. The operator periodically restocks the venders and collects the proceeds from the sale of articles dispensed by the venders, and typically remits a portion of the proceeds to the owner of the premises. A large vender operator may operate many
20 hundreds of bulk venders, employing service personnel to service the venders and deliver the coins which have accumulated within the cash box to the operator.

Bulk venders are intended particularly for use in unsupervised public areas, and as such are designed to resist tampering, theft and vandalism by patrons. However, since in a conventional bulk vender the number of articles dispensed from each
25 vender is not monitored, so that the vender operator can never know how many coins should be collected from any particular vender during a service call, the operator is highly

vulnerable to the theft of coins by the operator's service personnel. The operator can also be vulnerable to the substitution of slugs for coins by service personnel before the collected coins are delivered to the operator.

In either case the operator's proceeds can be significantly reduced. This significantly limits an operator's ability to expand his or her business because the operator is either limited to using only employees known to be trustworthy, or runs the risk of substantial losses due to skimming by employees. Further, this reduces the operator's ability to account to the owner of the premises on which a vender is located, because the operator can never be certain when remitting a portion of the proceeds to the owner of the premises that all monies collected by the vender have been accounted for.

Moreover, because bulk vendors are designed for self service by users with minimal maintenance, they are frequently placed in locations where their use cannot be readily supervised. As a result bulk vendors are readily susceptible to theft, and when recovered the authorities may have no way of identifying the operator/owner of the vender. Also, occasionally a vender may be abandoned by its operator, or for some reason the operator may have to be notified regarding a problem with the vender, and there is occasionally no easy way to identify the owner of the vender.

Summary of the Invention

The present invention overcomes these disadvantages by providing a tracking system for bulk vendors. In the preferred embodiment the system of the invention counts each vend responsive to rotation through a cycle of the coin mechanism, and records the date and time of each vend.

The invention accomplishes this by providing an active tag, in the form of a microchip disposed in a housing, which has a memory for storing data representing a vending event, for example the date and time of the event. The data is periodically read by a hand-held reader or "interrogator," which downloads the data stored in the tag memory and erases the memory to reset the tag for continued monitoring of the vender.

With this information an operator can reconcile the number of coins collected from the vender with the number of vends recorded, to ensure that the operator's proceeds are not being stolen by employees. The presence of the tag would inhibit theft to such an extent that an operator would no longer have to limit the expansion of his or her business because a much greater pool of potential employees becomes available to the operator, which significantly increases the number of venders that the operator can service.

The recorded information also allows an operator to determine when the vender is likely to need restocking, to thereby anticipate servicing requirements; to track when vends take place and over what period of time, to help in determining the commercial viability of a vender location; and to track the work habits of service personnel and determine their operating efficiency.

In the preferred embodiment the tag transmits the data via a radio frequency (RF) signal, has a unique identification code, and operates responsive to a digital key which allows only a reader having a corresponding key to task the tag for data and erase its memory. Thus, the tag not only monitors the activity of the vender, but also provides an instant indication as to the identity of the owner/operator.

Brief Description of the Drawings

In drawings which illustrate by way of example only a preferred embodiment of the invention,

Figure 1 is a perspective view of a bulk vender embodying the invention,

Figure 2 is a rear perspective view of a coin mechanism embodying the invention, and

Figure 3 is a rear elevation of the cover plate of the coin mechanism of Figure 2.

Detailed Description of the Invention

Figure 1 illustrates a typical bulk vender 2 in which the system of the invention may be employed. The vender 2 conventionally includes a lower housing 4 enclosing the workings of the coin mechanism 10 and a cash box (not shown) for collecting deposited coins or tokens 1, a transparent article storage bin 5 for storing merchandise such as gum balls or other articles to be dispensed, and a turntable 6 which is rotated by rotation of the coin mechanism 10 to align one of a plurality of product conveyors with the opening to a dispensing chute 8, as is well known. A vender of this type is described and illustrated in United States Patent No. 5,954,181 for a "Coin Mechanism with Magnetic Locking System" issued on September 21, 1999, which is incorporated herein by reference. It will be appreciated that this is merely one example of a bulk vender in which the invention can be implemented, and the description thereof is not intended to be limiting.

Although the invention will be described with reference to a coin, the term "coin" as used herein includes coins and tokens and like elements and is in no way restricted to currency or coins having a monetary value. It will also be understood that the coin mechanism of the invention may be used in other types of apparatus which do not necessarily dispense merchandise, for example parking meters, and the invention is not restricted to any particular application of the coin mechanism 10.

Figures 2 and 3 illustrate a preferred embodiment of a coin mechanism 10 embodying the invention. The mechanism 10 comprises a cover plate 20 having a coin opening 24. A handle 30 is fixed to a tapered shaft 32 which extends through an opening formed by a nipple 26 projecting from the cover plate 20 and engages an opening 38 disposed through the centre of a substantially disc-shaped coin conveyor 40. The shaft 32 has a longitudinal flat (or slightly concave) surface 32a allowing it to rotationally engage the coin conveyor 40.

The coin conveyor 40 includes a coin receiving portion for receiving a coin 1 which comprises a recess 42 formed to the size of the intended coin 1, in which the coin 1 nests as it is conveyed about the rotational cycle of the coin mechanism 10. In the illustrated embodiment the coin conveyor 40 is provided with peripheral ratchet teeth 41 which cooperate with a pawl to prevent reverse rotation of the mechanism 10 during most of the rotational cycle (a small radius of reverse rotation is permitted immediately beyond the rest position, which allows the coin conveyor 40 to revert to the rest position if the measuring devices reject the deposited coin).

A back plate 80 overlays the coin conveyor 40 and is affixed to the cover plate 20 so as to be stationary relative thereto, as by bolts 81. The back plate 80 retains a coin 1 in the coin recess 42 along the rotational path followed by the coin 1 as the handle 30 is rotated. The shaft 32 extends through an opening 86 in the back plate 80 and is rotationally engaged to a dispensing gear 64 for rotating the turntable 6. Thus, the cover plate 20 and back plate 80 remain stationary, while the coin conveyor 40 and gear 64 are fixed in position on the shaft 32 and rotate as the handle 30 is turned.

A dog 70 for measuring the thickness of a coin 1 may be mounted on the back plate 80 biased against the coin recess 42 by a spring 70a, to catch the trailing edge of the coin recess 42 if a deposited coin or slug is thinner than the intended coin 1 and arrest rotation of the mechanism 10. Conventionally a diameter measuring dog 34 for measuring the diameter of the coin 1 is pivotally mounted on the cover plate 20, biased against the coin conveyor 40 by a spring 34a, to catch on the trailing corner 35 of the coin recess 42 if a deposited coin or slug has a diameter smaller than the intended coin 1 and thus arrest rotation of the mechanism 10. The coin conveyor 40 thus conveys the proper coin 1 to the coin ejection ramp 25, where it falls into a coin tray (not shown) concealed within the vender housing 4, along a specific rotational path that allows the measuring dog 34 to measure the coin 1 at the designated radial position. If a deposited coin or slug is not of the correct size, the dog 34 cooperates with the coin conveyor 40 to arrest rotation of the mechanism 10.

According to the invention, a tag is provided to record vending events. The tag may be a radio frequency identification (RF ID) tag 110, which comprises a ROM containing a non-erasable identification code and at least one digital key, along with any necessary operating software; an RF transceiver for receiving instructions from a reader or "interrogator" 100 (shown in Figure 1) and transmitting data to the interrogator 100; a clock; and a RAM for storing vending activity data, in the preferred embodiment representing the date and time of each complete revolution of the coin mechanism 10, and optionally the type of merchandise with which the vender 2 is stocked; all integrated into a single chip. Such RF ID tags are commercially available for use with electronic devices, for example for recording temperature measurements from an electronic thermometer or thermostat.

In the preferred embodiment, the tag 110 is hermetically sealed in a housing 112 along with a power source 114, for example a commercially available compact lithium battery. The tag is preferably disposed between the cover plate 20 and back plate 80, positioned so that the tag transceiver is capable of communicating with the interrogator 100 positioned in front of the coin mechanism 10, as shown in Figure 1. If necessary the portion of the cover plate 20 overlaying the tag 110 can be reduced in thickness, or a non-metallic insert can be affixed into the cover 20 over the tag 110, to create an RF "window" which allows the tag transceiver to communicate with the interrogator 100.

The RF signal from the tag 110 should be kept at a fairly low power, to conserve energy and ensure that if venders are in close proximity to one another, data is being retrieved only from the vender being interrogated. Thus, the interrogator 100 must be held fairly close to (for example, within 10 cm), or in contact with, the cover plate 20 of the coin mechanism 10.

According to the invention, an interface 120 is provided to recognize the motion of the coin mechanism turning through a complete cycle -- which is representative

of a single vending event -- and generate a pulse which incrementally increases the vend count in the tag 110 and preferably records the date and time of the vending event. In one preferred embodiment shown in Figure 3, the interface 120 may comprise a metallic dog 122 having at each end an upstanding finger 122a, 122b in the path of a coin 1. A contact box 124 is positioned with contacts 126 facing the finger 122b, so that as the coin 1 passes the finger 122a it pushes the finger 122b against the contacts 126 to thus close a circuit through wires 128 and generate a count pulse in the tag 110. As the coin passes the finger 122b it pushes the finger 122b away from the contacts 126. The dog 122 is preferably frictionally engaged to a hub 121, so that it will not slip between the open and closed positions if the machine is shaken or subjected to vibration.

Alternatively, the interface 120 may comprise a proximity sensor actuated by a density differential, reflective surface or other proximity actuator on the coin conveyor 40; a reed switch responsive to a magnet embedded in the coin conveyor; or some other activating interface which closes a circuit to generate a pulse on the event input pin of the tag 110. In each case the interface 120 is located at a position in the rotational cycle of the coin mechanism 10 at which the coin has already been accepted, so that the tag 110 does not falsely count partial rotations through the free-turning portion of the beginning of the coin mechanism cycle as actual vends.

In operation, the vender 2 is set up in the selected location and the storage bin 5 is stocked with merchandise. The interrogator 110 is positioned as shown in Figure 1, and activated to signal the tag 110 to switch out of 'sleep' (power saving) mode and transmit its identification code. If this is the first interrogation, the interrogator 100 is initialized to the tag 110, i.e. the operator key stored in ROM in the tag 110 is then programmed into the interrogator 100 and will thereafter be recognized by the interrogator 100. (Alternatively, the operator key can be preprogrammed into the interrogator 100 by the manufacturer as a recognized key). The identification code is retrieved by the interrogator 100 and the service person enters the location of the vender 10 into the interrogator 100 via an alpha-numeric keypad (not shown). Thereafter, each

time the coin mechanism 10 is rotated through a complete cycle, the cam 120 passes the switch 122 and the tag 110 counts another vend, and preferably associates with the vend event data representing the date and time of the vend.

Periodically, service personnel interrogate the tag 110 using the
5 interrogator 100, and retrieve the data stored in RAM. The interrogator 100 is used to signal the tag 110 to switch out of 'sleep' mode and transmit its identification code. If the operator key is recognized by the interrogator 100, the identification code is retrieved by the interrogator 100 along with the data representing vend events, which may include the date and time of a vend, and if desired a code representing the type of merchandise being
10 dispensed. When the data retrieval is complete, the interrogator 100 signals the tag 110 to erase its RAM and return to the 'sleep' mode.

After collecting data from a number of venders on a route, the data stored in the interrogator 100 is downloaded to a data collection system including a computer, for example a desktop or laptop PC (not shown), for review and analysis. The interrogator
15 may be placed into a cradle or otherwise docked directly to the computer (via cable, infrared, RF or otherwise), or may be provided with or connected to a modem for a dial-up connection to the computer.

The tag 110 is intended to be disposable. A currently-available lithium battery can last up to five years. Upon battery failure, or other failure of the tag 110, the
20 tag 110 would be discarded and replaced with a new tag 110. Although tags are commercially available which transmit at intervals, in the preferred embodiment the tag 110 transmits only when switched out of sleep mode by the interrogator 100, to conserve battery life and thus prolong the life of the tag 110.

Preferably the tag 110 also stores in ROM a manufacturer's or "master"
25 key, allowing the manufacturer to operate and retrieve information (such as the identification code) when it is necessary to identify the owner/operator of the vender. Additionally, preferably the manufacturer can program the interrogator 100 to recognize

(or reject) the operator key for any particular tag 110, or to reset a tag 110 so that another interrogator 100 can be initialized to the tag 110, in order to facilitate an operator selling part of a route or territory to another operator.

5 A preferred embodiment of the invention has been described by way of non-limiting example only. Those skilled in the art will appreciate that certain modifications and adaptations may be made without departing from the scope of the invention as claimed.

**THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:**

1. A vender comprising a merchandise storage portion and a coin mechanism having a handle exposed for rotation, whereby a selected amount of merchandise is dispensed with each rotational cycle of the coin mechanism, having a tracking system comprising

a tag having

a memory containing an identification code and at least one digital key,

an RF transceiver for receiving instructions from an interrogator and transmitting data to the interrogator, and

a RAM for storing vending event data; and

an interface for incrementally increasing a vend count stored in the RAM with each rotation of the coin mechanism.

2. The vender of claim 1 comprising a clock, wherein the vending event data comprises the date or time, or both, of each vend.

3. The vender of claim 1 wherein the vending event data comprises a code representing the type of merchandise being dispensed.

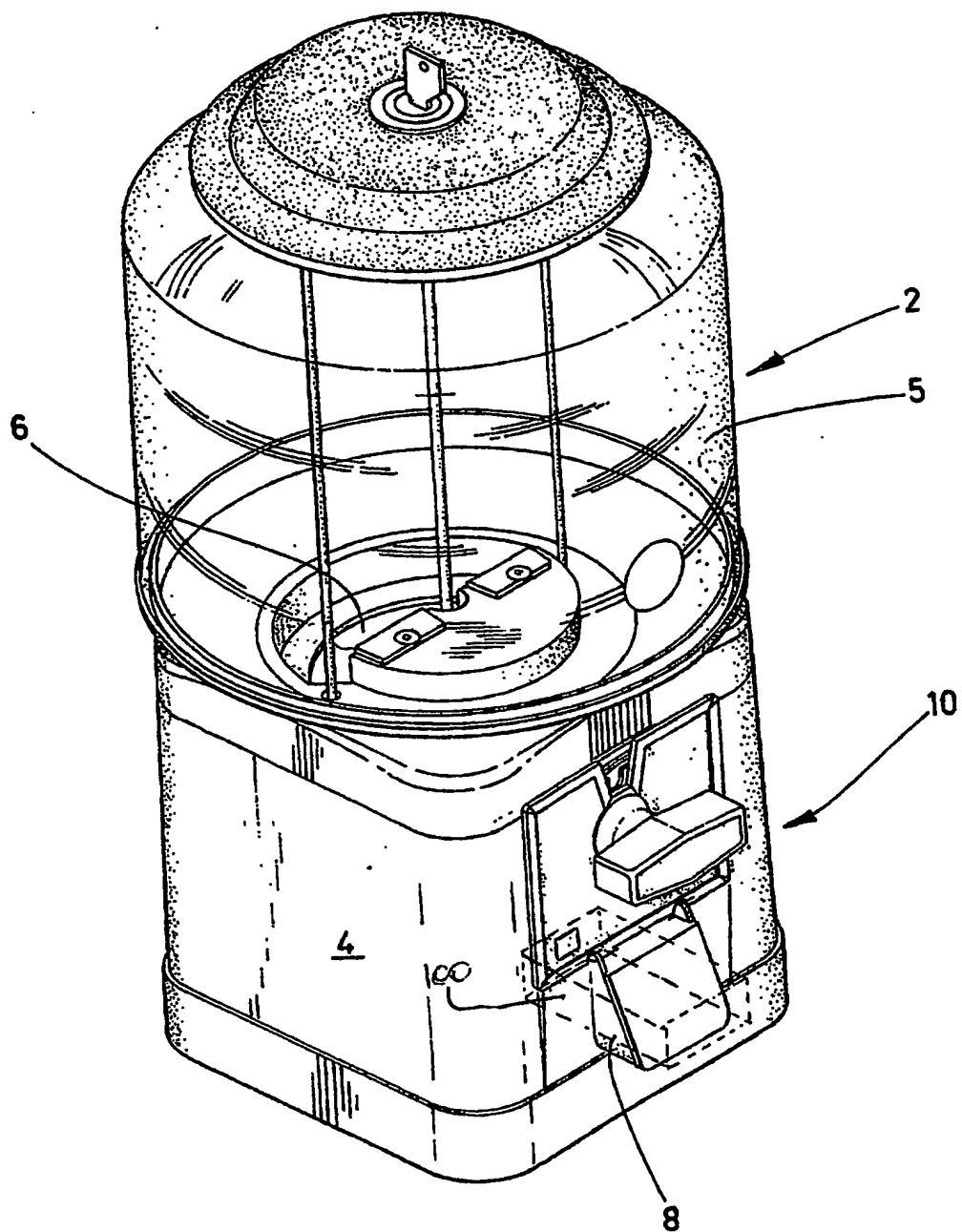


FIG. 1

